Towards Digital Twins for soccer robots: a use case in reusing artifacts

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Gijs Walravens
Supervisor: Loek Cleophas
Tutor: Hossain Muhammad Muctadir

Dept. of Mathematics and Computer Science, Software Engineering and Technology group
Robot soccer at TU/e—Middle size league (MSL)

General rules and restrictions:
- Inspired by FIFA regulations
- 1 goalie + 4 players
- Individual “eyes” and “brain”, nothing centralized
Digital Twin for soccer robots

Digital Twin could be used to:
- understand hardware and software
- analyze performance
- test changes
- apply new techniques e.g. ML

But: longstanding project
→ Can existing artifacts be used to realize DT?
Digital Twin 5D Model

Physical Entity

Data Collection

Iterative Optimization

Data

Services

Virtual Entity

Iterative Optimization

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Reusing the artifacts

Virtual Entity

Physical Entity

Iterative Optimization

Data Collection

Data

Services

Iterative Optimization

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Virtual Entity
Demo
Conclusion

• Existing artifacts save time in creating DT
• Easier to maintain and use due to reuse
• Still need knowledge of subsystems and domain expertise

Future work

This use case:
• Swap in components, test behavior
• Analyze data flow real-time
• Conduct predictive maintenance
• Troubleshoot from afar

General:
• Conduct more case studies to generalize
• Looking at artifacts: which, what phase, what purpose